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ATTORNEY DOCKET NO.  
45051-00004

*Handwritten:* #23-26-01  
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):  
U.S. Serial No.:  
U.S. Filing Date:

Mats OLSSON and Zhinong YING  
09/704,848  
November 2, 2000

Examiner:  
Group Number:

Not Yet Known  
2821

Title of Invention:

AN ANTENNA DEVICE, AND A PORTABLE  
TELECOMMUNICATION APPARATUS  
INCLUDING SUCH AN ANTENNA DEVICE



TECHNOLOGY CENTER 2001

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CLAIM OF PRIORITY UNDER 35 U.S.C. § 119

Under the provisions of 35 U.S.C. § 119 Applicants hereby claim the priority of Swedish  
patent application No. 9904002-4 as filed on November 3, 1999, which is identified in the  
declaration of the above-identified application. A certified copy of the priority document is  
filed herewith.

**ATTORNEY DOCKET NO.**  
**45051-00004**

**PATENT**

Applicants believe that no further information or documentation in support of its priority claim will be required.

Respectfully submitted,



Robert W. Mason  
Reg. No.: 42,848

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:sjm  
Enclosure

# PRV

PATENT- OCH REGISTRERINGSVERKET  
Patentavdelningen



## Intyg Certificat

Härmed intygas att bifogade kopior överensstämmer med de handlingar som ursprungligen ingivits till Patent- och registreringsverket i nedannämnda ansökan.

This is to certify that the annexed is a true copy of the documents as originally filed with the Patent- and Registration Office in connection with the following patent application.



(71) Sökande                      Telefonaktiebolaget L M Ericsson, Stockholm SE  
Applicant (s)

(21) Patentansökningsnummer      9904002-4  
Patent application number

(86) Ingivningsdatum                      1999-11-03  
Date of filing

Stockholm, 2000-11-09

För Patent- och registreringsverket  
For the Patent- and Registration Office

*Therese Friberger*  
Therese Friberger

Avgift  
Fee                      170:-

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## Multiband Antenna Arrangement

### BACKGROUND

The technical field is to implement an antenna arrangement in a small sized mobile phone that fulfils the demands on:

GSM triple band (900, 1800, 1900 MHz) + Bluetooth\* (2.4 GHz)

Good performance

Small size

Cost effectiveness

Assembly in high volumes

\*(Furthermore abbreviated as BT)

### STATE-OF-THE-ART

The BT antenna is placed as a separate unit apart from the GSM antenna. It is mainly located on the secondary side of the PCB.

(There are not yet any mobile phones on the market that carries a BT antenna.)

### PROBLEM

As mobile phones tend to get smaller in size, the PCB area also decreases. This means that baseband and radio components have priority in the PCB- layout.

As a reason of that, the BT antenna is located in areas on the keyboard side of the PCB, where the performance in talking position is not good (affected by the face of the user).

An antenna suitable for BT-voice applications should therefore be placed in a position somewhere on the backside of the phone, preferably in the top region where it is not covered by the hand.

### SOLUTION

To be able to develop thin, small sized mobile phones, mechanical as well as electrical components has to be integrated. Therefore, combining the GSM antenna and the BT antenna will result in a very dense and space saving component.

The solution comprises a flexfilm where the GSM triple band trace is placed together with the BT trace. The different traces have separated feeding and grounding pins.

The flexfilm can be mounted in a plastic/rubber housing which is assembled in the rear cover of the phone. The connection to PCB can be accomplished by "pogo-pins" mounted either on the PCB or in the antenna house.

In this multiband antenna arrangement, the GSM triple band trace is a triple band printed stub antenna, it has only a single feed pin. The antenna trace has to be outside of PCB (i.e. monopole type antenna). BT antenna is a PIFA type antenna, which is possible to mount on PCB. It has a feed pin and a ground pin. The triple band trace of GSM and BT antenna are printed on the same flexfilm.

The antenna connecting system is composed by "pogo pins" (both RF and grounding pins) and a external antenna connector for GSM (see enclosed drawing)

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### **MERITS OF INVENTION**

By placing the BT antenna in the top area of the back cover, the performance gets better. The user does not risk to shield the antenna in the same way compared to prior solutions.

Low component and development costs. We can almost have two antennas for the price of one. Development can probably be done without engage any external vendor. One component less to assemble. Assembly of the flexfilm in the antenna house can be quite easily done manually or fully automated.

Small size. The flexfilm is ~0.4mm thick and can be encapsulated in a thin flexible rubber housing. This shape also gives the ID- designer opportunities for adding new exciting form features to the phone.



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## CLAIMS

- CLAIMS
1. A portable telecommunication device having a first antenna system for performing telecommunication in at least two frequency bands and a second antenna system for performing short-range data communication, characterised in that the first and second antenna systems are formed on a common support element.
2. A portable telecommunication device as in claim 1, where the first and second antenna systems are traces of conductive material printed on said support element.
3. A portable telecommunication device as in claim 1 or 2, where said support element is a flex film.
4. A portable telecommunication device as in any preceding claim, where said support element is located in a housing portion of the portable telecommunication device.
5. A portable telecommunication device as in any preceding claim, where the first antenna system is a triple-band system.
6. A portable telecommunication device as in any preceding claim, where the second antenna system is adapted for Bluetooth communication.
7. A portable telecommunication device as in any preceding claim, further comprising a printed circuit board and radio circuits mounted thereon, wherein resilient connecting pins are provided for coupling the first and second antenna systems to said printed circuit board.

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# ABSTRACT

A portable telecommunication device has a first antenna system for performing telecommunication in at least two frequency bands. It also has a second antenna system for performing short-range data communication. The first and second antenna systems are formed on a common support element.





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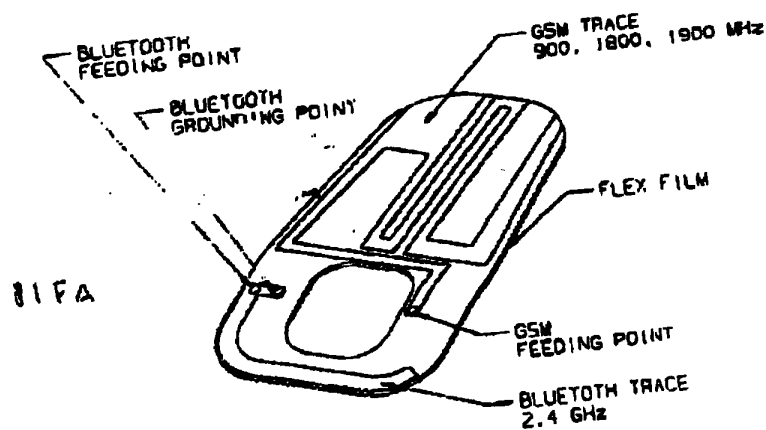
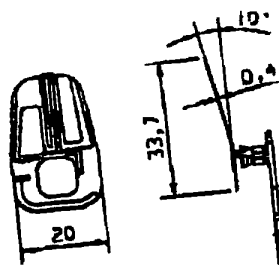
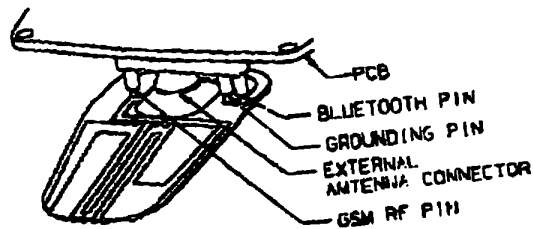
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# MULTIBAND ANTENNA



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